

**What is claimed is:**

- 1        1. A silicoaluminophosphate molecular sieve comprising a surface  
2 heat impregnated with a metal selected from the group consisting of Group IIA  
3 metals, Group IIIA metals, Group IB metals, Group IIB metals, Group IIIB  
4 metals, Group VIB metals, Group VB metals, Group VIB metals, Group VIIIB  
5 metals, Group VIIIB metals, and mixtures thereof.
- 1        2. The silicoaluminophosphate molecular sieve of claim 1 wherein the  
2 silicoaluminophosphate molecular sieve is selected from the group consisting of  
3 SAPO-5, SAPO-8, SAPO-11, SAPO-16, SAPO-17, SAPO-18, SAPO-20, SAPO-  
4 31, SAPO-34, SAPO-35, SAPO-36, SAPO-37, SAPO-40, SAPO-41, SAPO-42,  
5 SAPO-44, SAPO-47, SAPO-56, the metal containing forms thereof, and mixtures  
6 thereof.
- 1        3. The silicoaluminophosphate molecular sieve of claim 2 wherein the  
2 silicoaluminophosphate molecular sieve is selected from the group consisting of  
3 SAPO-18, SAPO-34, SAPO-35, SAPO-44, SAPO-47, and mixtures thereof.
- 1        4. The silicoaluminophosphate molecular sieve of claim 3 wherein the  
2 silicoaluminophosphate molecular sieve is selected from the group consisting of  
3 SAPO-34A, SAPO-34B, and mixtures thereof.
- 1        5. The silicoaluminophosphate molecular sieve of claim 1 wherein the  
2 silicoaluminophosphate molecular sieve comprises 0.5 to 40 percent by weight of  
3 the metal.
- 1        6. The silicoaluminophosphate molecular sieve of claim 5 wherein the  
2 silicoaluminophosphate molecular sieve comprises 1 to 20 percent by weight of  
3 the metal.
- 1        7. The silicoaluminophosphate molecular sieve of claim 6 wherein the  
2 silicoaluminophosphate molecular sieve comprises 1 to 10 percent by weight of  
3 the metal.

1        8.     The silicoaluminophosphate molecular sieve of claim 1 wherein the  
2 metal is selected from the group consisting of aluminum, magnesium, calcium,  
3 barium, lanthanum, titanium, chromium, iron, cobalt, nickel, copper, zinc, and  
4 mixtures thereof.

1        9.     The silicoaluminophosphate molecular sieve of claim 8 wherein the  
2 metal is copper, zinc, or a mixture thereof.

1        10.    The silicoaluminophosphate molecular sieve of claim 9 wherein the  
2 molecular sieve comprises the metal of 1 to 20 percent by weight based on the  
3 total weight of the molecular sieve.

1        11.    The silicoaluminophosphate molecular sieve of claim 1 wherein the  
2 metal is a heat decomposition product of a metal acetate, metal nitrate, metal  
3 sulfate, or metal halide.

1        12.    The silicoaluminophosphate molecular sieve of claim 1 wherein the  
2 surface is heat impregnated with the metal at a temperature from 30°C to 400°C.

1        13.    The silicoaluminophosphate molecular sieve of claim 12 wherein  
2 the surface is heat impregnated with the metal at a temperature from 120°C to  
3 260°C.

1        14.    The silicoaluminophosphate molecular sieve of claim 13 wherein  
2 the surface is heat impregnated with the metal at a temperature from 160°C to  
3 220°C.

1        15.    A silicoaluminophosphate molecular sieve catalyst comprising:  
2              a surface heat impregnated with a metal selected from the group  
3              consisting of Group IIA metals, Group IIIA metals, Group IB metals, Group IIB  
4              metals, Group IIIB metals, Group VIB metals, Group VB metals, Group VIB  
5              metals, Group VIIB metals, Group VIIIB metals, and mixtures thereof; and  
6              a binder.

1        16. The silicoaluminophosphate molecular sieve catalyst of claim 15  
2        wherein the silicoaluminophosphate molecular sieve is selected from the group  
3        consisting of SAPO-5, SAPO-8, SAPO-11, SAPO-16, SAPO-17, SAPO-18,  
4        SAPO-20, SAPO-31, SAPO-34, SAPO-35, SAPO-36, SAPO-37, SAPO-40,  
5        SAPO-41, SAPO-42, SAPO-44, SAPO-47, SAPO-56, the metal containing  
6        forms thereof, and mixtures thereof.

1        17. The silicoaluminophosphate molecular sieve catalyst of claim 16  
2        wherein the silicoaluminophosphate molecular sieve is selected from the group  
3        consisting of SAPO-18, SAPO-34, SAPO-35, SAPO-44, SAPO-47, and mixtures  
4        thereof.

1        18. The silicoaluminophosphate molecular sieve catalyst of claim 17  
2        wherein the silicoaluminophosphate molecular sieve is selected from the group  
3        consisting of SAPO-34A, SAPO-34B, and mixtures thereof.

1        19. The silicoaluminophosphate molecular sieve catalyst of claim 15  
2        wherein the silicoaluminophosphate molecular sieve comprises 0.5 to 40 percent  
3        by weight of the metal.

1        20. The silicoaluminophosphate molecular sieve catalyst of claim 19  
2        wherein the silicoaluminophosphate molecular sieve comprises 1 to 20 percent by  
3        weight of the metal.

1        21. The silicoaluminophosphate molecular sieve catalyst of claim 20  
2        wherein the silicoaluminophosphate molecular sieve comprises 1 to 10 percent by  
3        weight of the metal.

1        22. The silicoaluminophosphate molecular sieve catalyst of claim 15  
2        wherein the metal is selected from the group consisting of aluminum, magnesium,  
3        calcium, barium, lanthanum, titanium, chromium, iron, cobalt, nickel, copper,  
4        zinc, and mixtures thereof.

1        23.     The silicoaluminophosphate molecular sieve catalyst of claim 22  
2 wherein the metal is copper, zinc, or a mixture thereof.

1        24.     The silicoaluminophosphate molecular sieve catalyst of claim 23  
2 wherein the molecular sieve comprises the metal at 1 to 20 percent by weight  
3 based on the total weight of the molecular sieve.

1        25.     The silicoaluminophosphate molecular sieve catalyst of claim 15  
2 wherein the metal is a heat decomposition product of a metal acetate, metal  
3 nitrate, metal sulfate, or metal halide.

1        26.     The silicoaluminophosphate molecular sieve catalyst of claim 15  
2 wherein the surface is heat impregnated with the metal at a temperature from 30°C  
3 to 400°C.

1        27.     The silicoaluminophosphate molecular sieve catalyst of claim 26  
2 wherein the surface is heat impregnated with the metal at a temperature from  
3 120°C to 260°C.

1        28.     The silicoaluminophosphate molecular sieve catalyst of claim 27  
2 wherein the surface is heat impregnated with the metal at a temperature from  
3 160°C to 220°C.

1        29.     The silicoaluminophosphate molecular sieve catalyst of claim 15  
2 wherein the binder is selected from the group consisting of alumina, aluminum  
3 chlorhydrat, clay, and mixtures thereof.

1        30.     A method of making a molecular sieve comprising:  
2              a)     mixing a metal containing solution with a  
3     silicoaluminophosphate molecular sieve, wherein the silicoaluminophosphate  
4     molecular sieve contains a template;

5           b)     heating the mixture to a temperature between 30°C and  
6     400°C to obtain a silicoaluminophosphate molecular sieve having a surface heat  
7     impregnated with a metal;  
8           c)     separating the heated silicoaluminophosphate molecular  
9     sieve from the heated metal containing solution; and  
10          d)     calcining the separated silicoaluminophosphate molecular  
11     sieve.

1           31.    The method of claim 30 wherein the silicoaluminophosphate  
2     molecular sieve is selected from the group consisting of SAPO-5, SAPO-8,  
3     SAPO-11, SAPO-16, SAPO-17, SAPO-18, SAPO-20, SAPO-31, SAPO-34,  
4     SAPO-35, SAPO-36, SAPO-37, SAPO-40, SAPO-41, SAPO-42, SAPO-44,  
5     SAPO-47, SAPO-56, the metal containing forms thereof, and mixtures thereof.

1           32.    The method catalyst of claim 31 wherein the  
2     silicoaluminophosphate molecular sieve is selected from the group consisting of  
3     SAPO-18, SAPO-34, SAPO-35, SAPO-44, SAPO-47, and mixtures thereof.

1           33.    The method of claim 32 wherein the silicoaluminophosphate  
2     molecular sieve is selected from the group consisting of SAPO-34A, SAPO-34B,  
3     and mixtures thereof.

1           34.    The method of claim 30 wherein the calcined  
2     silicoaluminophosphate molecular sieve comprises 0.5 to 40 percent by weight of  
3     the metal.

1           35.    The method of claim 34 wherein the calcined  
2     silicoaluminophosphate molecular sieve comprises 1 to 20 percent by weight of  
3     the metal.

1           36.    The method of claim 35 wherein the calcined  
2     silicoaluminophosphate molecular sieve comprises 1 to 10 percent by weight of  
3     the metal.

1        37.     The method of claim 30 wherein the metal is selected from the  
2 group consisting of Group IIA metals, Group IIIA metals, Group IB metals,  
3 Group IIB metals, Group IIIB metals, Group VIB metals, Group VB metals,  
4 Group VIIB metals, Group VIIIB metals, and mixtures  
5 thereof.

1        38.     The method of claim 30 wherein the metal is selected from the  
2 group consisting of aluminum, magnesium, calcium, barium, lanthanum, titanium,  
3 chromium, iron, cobalt, nickel, copper, zinc, and mixtures thereof.

1        39.     The method of claim 38 wherein the metal is copper, zinc, or a  
2 mixture thereof.

1        40.     The method of claim 30 wherein the metal is a heat decomposition  
2 product of a metal acetate, metal nitrate, metal sulfate, or metal halide.

1        41.     The method of claim 30 wherein the surface is heat impregnated  
2 with the metal at a temperature from 30°C to 400°C.

1        42.     The method of claim 41 wherein the surface is heat impregnated  
2 with the metal at a temperature from 120°C to 260°C.

1        43.     The method of claim 42 wherein the surface is heat impregnated  
2 with the metal at a temperature from 160°C to 220°C.

1        44.     The method of claim 30 wherein, the mixture is heated at  
2 autogeneous pressure.

1        45.     The method of claim 30 wherein the metal containing solution has  
2 a metal concentration between 0.01 M and 1.0 M.

1        46.     The method of claim 45 wherein the metal containing solution has  
2 a metal concentration between 0.05 M and 0.5 M.

1        47. The method of claim 46 wherein the metal containing solution has  
2 a metal concentration between 0.08 M and 0.3 M.

1        48. The method of claim 30 wherein the metal containing solution  
2 comprises metal salts selected from the group consisting of acetates, nitrates,  
3 sulfates, halides, and mixtures thereof.

1        49. A method of making an olefin from an oxygenate feedstock  
2 comprising:

3              providing a catalyst comprising a silicoaluminophosphate  
4 molecular sieve having a surface heat impregnated with a metal selected from the  
5 group consisting of Group IIA metals, Group IIIA metals, Group IB metals,  
6 Group IIB metals, Group IIIB metals, Group VIB metals, Group VB metals,  
7 Group VIIB metals, Group VIIIB metals, Group VIIIB metals, mixtures thereof,  
8 and a binder; and

9              contacting the oxygenate feedstock with the catalyst.

1        50. The method of claim 49 wherein the silicoaluminophosphate  
2 molecular sieve is selected from the group consisting of SAPO-18, SAPO-34,  
3 SAPO-35, SAPO-44, SAPO-47, and mixtures thereof.

1        51. The method of claim 49 wherein the metal is copper, zinc, or a  
2 mixture thereof.

1        52. The method of claim 51 wherein the silicoaluminophosphate  
2 molecular sieve comprises 1 to 20 percent by weight of the metal.

1        53. The method of claim 49 wherein the oxygenate feedstock  
2 comprises methanol.